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ABSTRACT

OPTICALLY INTRACONNECTED COMPUTER EMPLOYING DYNAMICALLY RECONFIGURABLE HOLOGRAPHIC OPTICAL ELEMENT

An optically intraconnected computer and a reconfigurable holographic optical element employed therein. The basic computer comprises a memory for holding a sequence of instructions to be executed; logic for accessing the instructions in sequence; logic for determining for each the instruction the function to be performed and the effective address thereof; a plurality of individual elements on a common support substrate optimized to perform certain logical sequences employed in executing the instructions; and, element selection logic connected to the logic determining the function to be performed for each the instruction for determining the class of each function and for causing the instruction to be executed by those the elements which perform those associated the logical sequences affecting the instruction execution in an optimum manner. In the optically intraconnected version, the element selection logic is adapted for transmitting and switching signals to the elements optically. To this end there is a holographic optical element including a holographic reflective surface mounted adjacent and parallel to the common support substrate; a plurality of light sources carried by the common support substrate for directing signal-modified light beams towards the holographic reflective surface to be reflected thereby back towards the common support substrate; and, a plurality of light detectors carried by the common support substrate and operably connected to respective ones of the elements to provide electrical signals thereto for detecting selected ones of the light beams as reflected by the holographic reflective surface and providing associated electrical signals derived from the reflected light beams. The preferred apparatus for affected the optical intraconnection is a dynamically reconfigurable holographic optical element comprising a planar holographic optical element having a

holographic reflective surface for reflecting light beams directed thereon in a controlled manner and a spatial light modulator for selectively blocking and passing light beams at individual pixel positions thereof disposed adjacent the holographic reflective surface. The spatial light modulator is adapted for switching between the blocking and passing of light beams at the individual pixel positions thereof in response to control signals received at an input thereof. In the preferred embodiment, the spatial light modulator is disposed on the holographic reflective surface.